

In this way a linear relationship was obtained with regression equation $Y = 28.05 + 0.55X$. This linear relationship would become distinctly curvilinear if the extremes of temperature are also considered (Andrewartha and Birch 1954).

The effect of temperature on developmental stages is given in Table 1. As the temperature increased the total duration of pre-adult stage decreased, thus showing an inverse relation. The ideal range of temperature was between 15° and 26°C for larval and pupal development.

DISCUSSION

The development and activity in many insects increase in proportion with the suitability of climatic conditions particularly in the tropics (Dakshinamurty 1948). Under laboratory conditions the success of the experiment depends on the culture medium and development of the larvae. *Sepsis nitens* lays its eggs in dung masses which hatch out within days in the laboratory. The eggs are similar to those of *S. lateralis*, described by Hafez (1947). The larval features of *S. nitens* are similar to those of European and American Sepsidae (Henning 1952, Wharton and Roeger 1977).

The present series of observations suggested that the incubation period could be greatly dependent on temperature conditions and is prolonged at lower

temperatures. Therefore the environmental conditions may be important for the breeding and growth of sepsids in nature.

The humidity is also important in larval development. For sepsids the moist dung mass kept at temperatures of 20° to 28°C was ideal for development. The combined effect of temperature and humidity can be profound on the larval development. Hammer (1942) could not find larvae of sepsid flies during the winter months. The viability of eggs and the development of larvae is inversely related to temperature. Normal development would be obtained within the limits of favourable range of temperatures and humidity. The pupal period reduced with increasing temperature but at higher temperature there is a risk of death of larvae and pupae due to drying of the medium.

ACKNOWLEDGEMENT

I express my sincere gratitude to Professor Nawab Hasan, former Head, Department of Zoology, under whose guidance this study was carried out.

March 7, 1995

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31. RECORD OF THREE SPECIES OF *RHOMBOGNATHUS* (HALACARIDAE: ACARI) FROM INDIAN OCEAN REGION

(With twentyfive text-figures)

Species of the Subfamily Rhombognathinae are phytophagous in nature. All occur in photic zone of marine or brackish water and mainly occur in association with algae, though a few forms have also been reported from interstitial sands.

Rhombognathus apsteini Lohmann is known from Kerguelen Island of temperate Indian Ocean (Lohmann

1907 a, b; Bovee *et al.* 1973, Newell 1984). Rao and Ganapati 1968 reported *Rhombognathus* sp. from interstitial sands of Waltair coast.

Rhombognathus papuensis Bartsch, 1989

Many specimens were collected among different algae from Visakhapatnam coast, Cape Comorin coast, Kovalam

coast, and Andaman and Nicobar Islands.

MALE: The idiosomal length of males ranges from 252 μ to 350 μ .

All dorsal plates are separate (Fig 1). Paneled sculpture present medially and distally on AD, anteriorly and posteriorly on OC, and medially and laterally on PD. One pair of setae are present medially and one pair of gland pores laterally above the level of insertion of leg I on AD. OC with two antero-lateral corneae and two lateral glandular pores. OC is quadrate in outline and with two setae (one near the corneal zone and one posteriorly). PD becomes narrow anteriorly. PD with one pair of setae and two costae made up of porose panels.

All ventral plates are fused (Fig. 3).

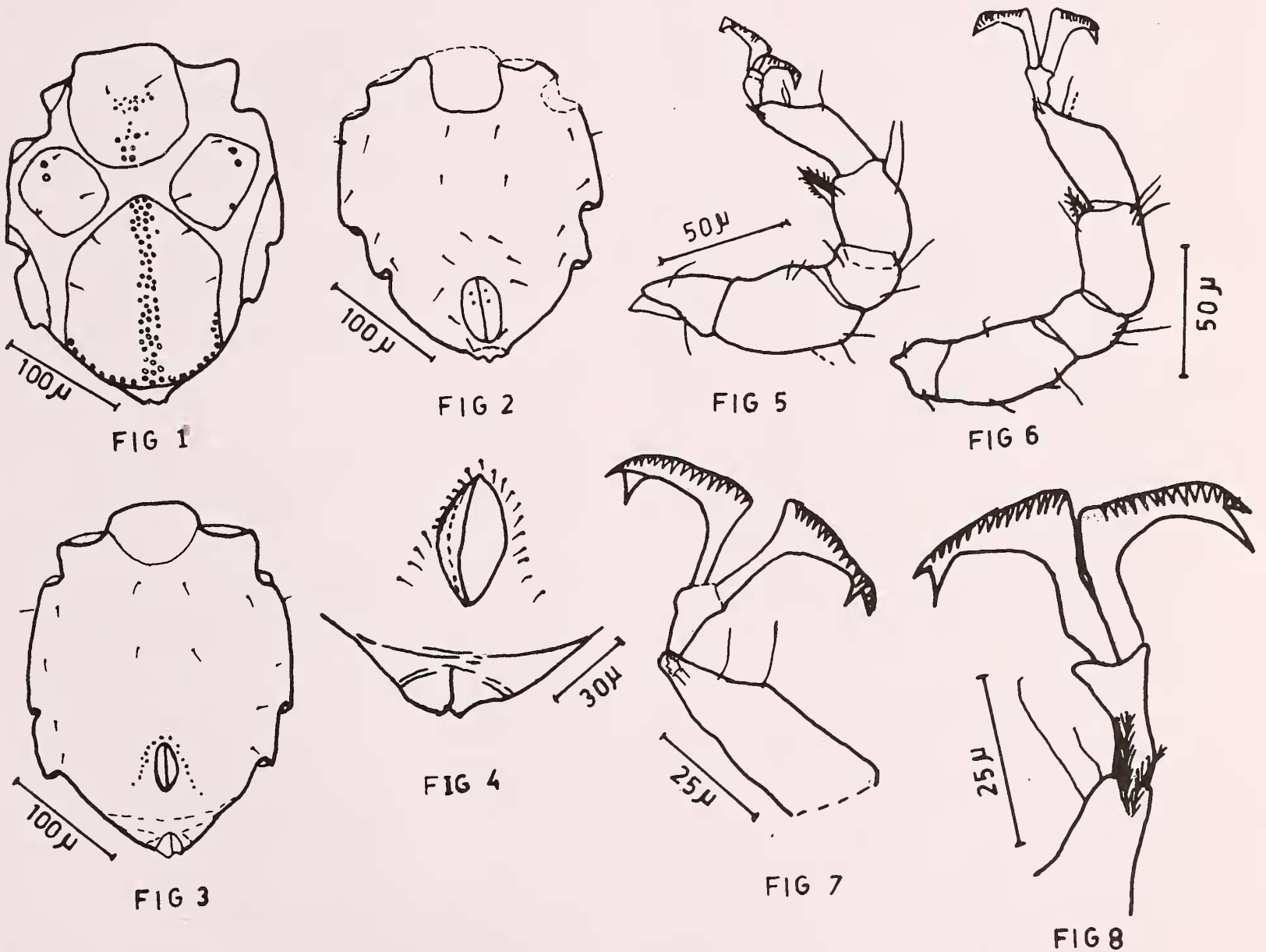
AE area bears Aes I, Aes IIv and Aes II lat with which one adjunctive seta is associated. PE area bears Pes IIIv,

Pes III lat, Pes IV plus one adjunctive seta associated with Pes III lat. 11-13 pairs of plumose perigenital setae including one isolated basal seta are arranged in two discrete rows on each side of GO. Two pairs of subgenital setae are present (Fig. 4).

Telefemora III and IV devoid of any ventral setae. Patella I with five setae; all setae are smooth without any pectination or spiny nature. Tibiae I and IV with five setae, of which two are pectinate.

Tarsus I with 3 dorsal long setae, 1 solenidion, 1 profamulus and 4 PAS (2 doublets eupathidia) (Fig. 5). Tarsus II is similar to the former except for the absence of profamulus (Fig. 6). Tarsus III with 3 dorsal fossary setae, 1 basidorsal seta and 2 PAS Tarsus IV with 3 dorsal fossary setae and 2 PAS (two bristle-like setae) (Fig. 8).

All the legs bear carpite on tarsi and are devoid of a



Figs. 1-8. *Rhombognathus papuensis* Bartsch.: Fig. 1. Idiosoma-dorsal; Fig. 2. Idiosoma-ventral of female; Fig. 3. Idiosoma-ventral of male; Fig. 4. Genital area of male; Fig. 5. Basifemur to tarsus of Leg I; Fig. 6. Basifemur to tarsus of Leg II; Fig. 7. tarsus IV of female; Fig. 8. Tarsus IV of male.

median claw. Lateral claws bare of dorsal accessory process containing more than 17 tooth-like serrations.

FEMALE: (Fig. 2) Idiosomal length of females ranges between 250 μ and 350 μ . The female resembles the male very closely except for tarsus IV and GA region. Tarsus IV bears 3 dorsal setae and 2 PAS (one scaliform and one slender) (Fig. 7). 5 pairs of perigenital setae and 2 pairs of subgenital setae are present. Ovipositor bears 10 internal setae (Fig. 14).

Deutonymph: The idiosoma of a deutonymph is 157 μ long and 118 μ wide. All dorsal plates are separate and smaller than those of adult (Fig. 9). AD with 1 pair of setae. Anal plate and genital plate not separate. Genital foramen is not formed and two pairs of genital acetabulae are present (Fig. 10). Four pairs of legs are present.

Tritonymph: The idiosoma of tritonymph measured 243 μ in length and 175 μ width. All dorsal plates are separate and smaller than those of adult but longer than those of deutonymph (Fig. 11). Anal plate and genital plate are separated by cuticular membranous area (Fig. 12). Genital foramen is not formed. Three pairs of genital acetabula are present (Fig. 13). Four pairs of legs are present.

Distribution: Papua Guinea Island, Pacific Ocean, Bay of Bengal, Arabian Sea, Indian Ocean.

Remarks: The present find records the species for the first time from the Indian Ocean besides its first occurrence away from the type-locality (Papua Guinea island — Pacific Ocean). The nymphal stages of this species are also recorded for the first time. Bartsch (1989) did not comment on the internal setation of the ovipositor in *Rhombognathus papuensis*. In the present study, the ovipositor is observed and found to bear ten internal setae.

Rhombognathus scutulatus Bratsch, 1983

Many males and females were collected among different algae from Visakhapatnam, Cape Comorin, Kovalam, Andaman and Nicobar Islands (Corvin's Cove and Mus Island).

MALE: The idiosomal length of males ranged between 250 μ and 300 μ . All dorsal plates are fused and sculptured (Fig. 15). The sculpture is distinctly delineated at the corneal zone recalling the location of OC. AD bears a pair of setae at the level of leg I. OC with two setae, two antero-lateral corneae and two glandular pores, one pore is associated with the corneae and one located postero-laterally on OC area. Postero-dorsal area bears a pair of seta.

All ventral plates are completely fused. AE area with Aes I, Aes IIv, and Aes II lat near the margin bearing one

adjunctive seta associated with pes III lat. Eleven plumose PGS including one single isolated barsilar seta are arranged in two discrete rows on either side of the genital opening. Two SGS are present on each of the two sclerites (Fig. 16).

Gnathosoma small and compact. Palp is 4-segmented Palpal patella and trochanter without any setae. Palpal telofemur with one seta and palpal tibiotarsus with three setae.

Telofemora III and IV devoid of any ventral setae. Tibiae I and IV with 5 setae of which 2 setae are pectinate. Tibiae II and III with 5 setae including one pectinate. Tarsus I with 3 dorsal long setae, 1 soleniding, 1 profamulus and 4 PAS (two eupathidia doublets) (Fig. 18), Chaetotaxy of tarsus II similar to tarsus I except for the absence of profamulus (Fig. 19). Tarsus III with 4 dorsal fossary setae, two PAS (one scaliform serrated and one smooth and slender). Tarsus IV with 3 dorsal fossary setae and 2 PAS (two bristle-like setae).

All the legs bear carpite on tarsi and are devoid of a median claw. Lateral claws bear a dorsal accessory process containing more than 17 tooth-like serrations.

FEMALE: The idiosomal length of female ranges between 240 μ and 325 μ .

Female resembles the male in all features except for tarsus IV and GA region. In the case of female, tarsus IV bears 3 dorsal fossary setae and 2 PAS (one scaliform and one slender). GA with 5 PGS on either side of GO. Two SGS are present on GO (Fig. 17). Ovipositor bears 10 internal setae.

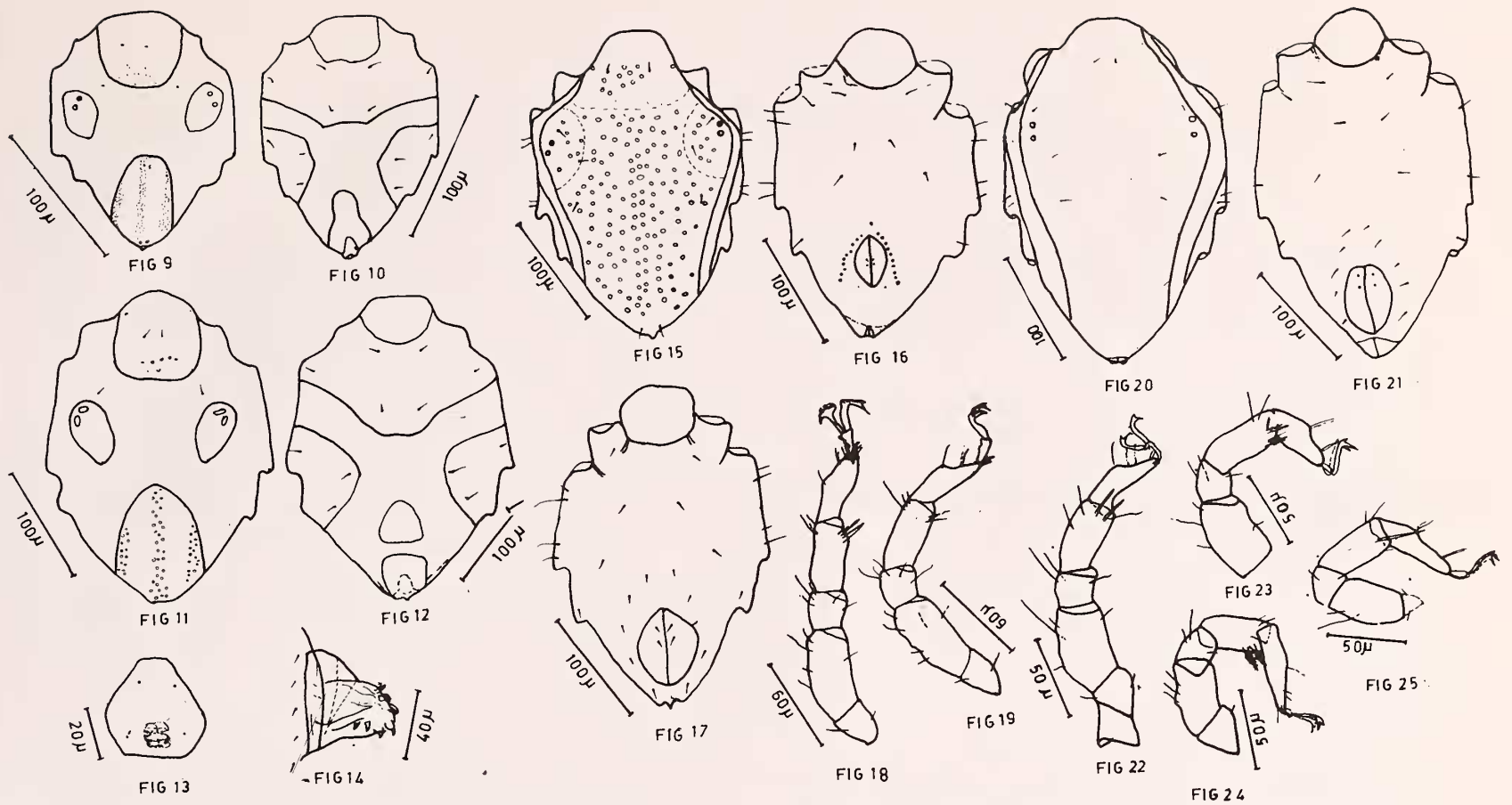
Distribution: Philippines. Bay of Bengal, Arabian Sea-Pacific Ocean. Indian Ocean-Present record.

Remarks: The ovipositor in the case of females was observed and is found to possess 10 internal setae confirming the assumption of Bartsch (1975) regarding the generic diagnostic value of the ovipositor setae present in all the species of genus *Rhombognathus*. The present find records the species for the first time from Indian Ocean besides its first occurrence away from the type-locality (Philippines — Pacific Ocean). The species is recorded here from Bay of Bengal, Arabian sea, Andaman and Nicobar Islands on a variety of algal substrates. Thus the species may be said to be widely distributed in the Indo-Pacific region.

Rhombognathus similis Bartsch, 1977

A single female was collected from the coralline algae *Halimeda oputina* from Mus Island (Nicobar Islands) — Bay of Bengal.

FEMALE: All dorsal plates are fused (Fig. 20) AD-area



Figs. 9-14. *Rhombognathus papuensis* Bartsch: Fig. 9. Idiosoma-dorsal of deutonymph; Fig. 10. Idiosoma-ventral of deutonymph; Fig. 11. Idiosoma-dorsal of tritonymph; Fig. 12. Idiosoma-ventral of tritonymph; Fig. 13. Genital plate of tritonymph; Fig. 14. Ovipositor showing internal setae.

Figs. 15-19. *Rhombognathus scutulatus* Bartsch.: Fig. 15. Idiosoma-dorsal of male; Fig. 16. Idiosoma-ventral of male; Fig. 17. Idiosoma-ventral of female; Fig. 18. Basifemur to tarsus of Leg I; Fig. 19. Basifemur to tarsus of Leg II.

Figs. 20-25. *Rhombognathus similis* Bartsch: Fig. 20. Idiosoma-dorsal of female; Fig. 21. Idiosoma-ventral of female; Fig. 22. Leg I; Fig. 23. Telo femur to tarsus of Leg II; Fig. 24. Basifemur to tarsus of Leg III; Fig. 25. Basifemur to tarsus of Leg IV.

with a pair of gland pores near the insertion of leg 1; ds1 on AD area below the level of 1st leg insertion. OC area with two corneae. The ds₂ are present anterior to the corneae while ds₃ at the postero-ventral region of OC area. PD area with a pair of setae below the level of insertion of leg III.

All ventral plates are fused (Fig. 21). AE area bears Aes I, Aes IIv and Aes II lat on the margin. PE area bears Pes IIIv, Pes III lat with an adjunctive associated seta and Pes IV. Five PGS are present on each side of the GO. Two SGS are present on each sclerite.

Telofemora: I and II with one ventral and three dorsal setae (Figs. 22, 23). Telofemora III and IV devoid of any ventral setae. Tibiae I and IV with 5 setae each (out of which two are bipectinate). Tibiae II and III with 5 setae each (out of which one is bipectinate). Tarsus I with 3 dorsal long setae, 1 solenidion, 1 profamule and 4 PAS (2 eupathidia doublets). Tarsus II similar to tarsus I except for the absence of profomules. Tarsus III with 4 dorsal fossary seta and 2 PAS (one scaliform dentatus and one slender) (Fig. 24). Tarsus IV with 3 dorsal fossary setae

and 2 PAS (one scaliform and one slender) (Fig. 25).

All legs with two lateral claws provided with a dorsal accessory process bearing 5-6 minute teeth ventrally.

Distribution: Galapagos Island — Pacific Ocean. Bay of Bengal — Indian Ocean — Present record.

Remarks: The specimens closely agree with the description given by Bartsch (1977). The find also records the occurrence of *R. similis* for the first time away from its type-locality, extending its zoogeographical distribution into the Indian Ocean.

ACKNOWLEDGEMENT

I wish to record my deep indebtedness to Dr. Ilse Bartsch, Biologische Anstalt Helgoland, Hamburg, Germany for her assistance.

February 2, 1995

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32. OCCURRENCE OF THE CRAB *EUXANTHUS EXSCULPTUS* (HERBST) IN GUJARAT

(With a text-figure)

During the study of the diet of a coastal migratory wader, the Crab Plover *Dromas ardeola* in the Gulf of Kachchh, Gujarat state, one of us (TM) analyzed fragments of the bodies of various crabs in the birds' regurgitated pellets. To facilitate identification of these fragments, a collection of over 500 crabs from the area was made on the Rozi coast (22° 33' N, 70° 02' E), near the Jamnagar port between August 1987 and May 1988. Almost all of these crabs had been recorded earlier from the Gujarat coast by Chhapgar (*J. Bombay nat. Hist. Soc.* 1957, 1958, 1961). There was one exception, namely *Euxanthus exsculptus* (Herbst) (*E. melissa* of Alcock). The width of the carapace was 69 mm.

The crab can be identified by the fairly sharp, irregularly scalloped antero-lateral borders being prolonged beneath the orbit to the buccal cavern, and by

the basal antennal joint jutting into the orbit, so that the antennal flagellum is inside the orbit. There is no denticle at the outer end of the orbit.

The antero-lateral borders are cut into five teeth, with a tubercle between the fourth and fifth teeth. The lobules of the carapace are smooth. The chelipeds are equal in size and the fingers, with strongly toothed cutting edges, have their tips hollowed.

Alcock (1989), recorded this species from the Andaman Islands, Sri Lanka, Mergui and Samoa, while Serene subsequently found it in Tahiti. The present find, therefore, constitutes a first record of this species from the west coast of India.

ACKNOWLEDGEMENT

We are grateful to H.G. Ghosh, Assistant Zoologist at the Zoological Survey of India, Calcutta (ZSI) for comparing the crab with one of Alcock's specimens in the collections of the ZSI, and for his comments.

March 14, 1995

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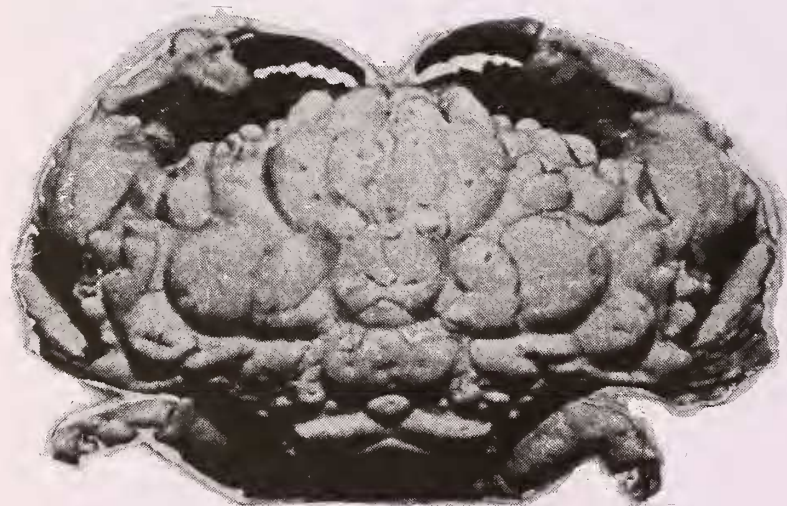


Fig. 1. *Euxanthus exsculptus* (Herbst).